

CONTRIBUTIONS AND ORIGINAL ARTICLES.

THE VIOLENT STORMS OF MARCH, 23, 1893.

[By H. A. HAZEN.]

Since 1890 a circular has been sent to every town or post office from which any word, either in the newspapers or elsewhere, has appeared regarding a destructive windstorm at that place. On March 23 the newspapers were full of accounts of destructive storms in Indiana, Illinois, Kentucky, Tennessee, and Mississippi. Nearly seventy places were mentioned, and replies to forty-seven of the circulars sent out will be found in the accompanying table.

At 8 p. m. of the 22d the general storm was in Oklahoma, with a pressure at the center of 29.4 inches. In the next twelve hours the center had moved to north Missouri, and the pressure was 29.44. At 8 p. m. of the 23d the general storm was central in Illinois, pressure 29.36. Most of the violent storms occurred in the southeast and south quadrants of this larger storm. An examination of the tracks of the storms shows that they occurred in lines running toward the northeast, as is usually the case. Also, in the table, in the column headed "moved," we find that with a very few exceptions, the observed direction of each storm, as indicated by the debris, was the same, or northeast.

An attempt has been made to separate these different tracts into thirteen groups, and the table shows each group. Four of the forty-seven replies show no marked storm. The times of the storms in general show a regular progression, though there are some exceptions. In eleven cases the funnel cloud was seen, though in nine it was too dark to see. In only three cases is there a failure to record thunderstorm as accompanying the violent wind. A loud roar was heard in all but four places. The occurrence of a whirl is not easily determined, and in nearly all cases it is probable that this was looked for in the

funnel itself. It is now well known that the evidence of a whirl and its direction of rotation from the cloud itself is very deceptive, and that one must rely upon the direction of debris, unless he is only 500 feet from the funnel, and even then the eye is liable to be greatly deceived by the appearances. The remarkable thing is, that four of the reports indicate a whirl *with* the hands of a clock, and only two counter-clockwise. One report has the whirl "toward center from both sides." Two reports of a whirl are not definite enough to determine the direction. Sixteen cases report no whirl. We must infer that very often there are very destructive storms going in the same general direction to the northeast, some of which do not show evidence of a whirl.

In sixteen cases the debris were left in the line of the storm, that is, lying in the direction of the storm or inclined toward the center. Only one reports debris in circular shape, and another reports "every way." Attention is called to the importance of this observation, and the extreme ease with which it may be made. Every storm which has a definite track must show some disposition of debris, and it is very much to be hoped that every one reporting such storm will pay particular attention to the distribution of the debris, trees, etc., in the center line of the storm, and on the left and right of this line. The number of persons reported killed is 19. The last column showing the loss to property, not to crops or fruit, is the most unsatisfactory of all, and is given merely as an approximation. In many cases it would appear that the loss is given for a very large region, and not for the town from which the report comes. Also, oftentimes the description in one town is for the storm in a neighboring town, and the latter sends its own report, so that the report is duplicated. This question of the actual destruction of structures in any town is one of the most important of all, and it is quite unfortunate that there is so much uncertainty regarding it.

Data relating to the violent storms of March 23, 1893.

Station.	Time.	Funnel.	Thunderstorm.	Roar.	Moved.	Whirl.	Débris left.	Glow in cloud.	Two clouds.	Persons killed.	Loss to property.
Oklahoma City, Okla. ¹	21.00	Yes	After	Yes	ne.	Clockwise	South side inward..	Around cloud ..	Single	None ...	\$15,000.
Jackson, Tenn.	17.00	Yes	Heavy	Yes	ne.	.....	.....	Light green	Yes	None ...	Severe.
Spring Creek, Tenn.	17.15	Yes	Heavy	Yes	ne.	No	Mostly to ne	Yes	w. and s.	None ...	\$800.
Do.	18.00	No	Moderate.	Yes	nw.	No	All to nw	None	No	None ...	\$500.
Luray, Tenn. ²	19.30	No	Light	Slight	nw.	No .....	.....	Greenish	No	None ...	.....
Dresden, Tenn.	17.30	No	Slight	Yes	ne.	Clockwise	All to ne.	Rather light....	No	None ...	Several thousand.
Murray, Ky.	17.50	Yes	Light	Yes	ne.	From se. to nw ..	Fell together....	Smoky	Yes	None ...	\$30,000.
Clarksville, Tenn.	19.30	No	Light .....	.....	ne.	.....	.....	.....	.....	None ...	Few hundred.
Hopkinsville, Ky.	21.30	Too dark.	Light	Slight	ne.	No .....	.....	.....	No	None ...	\$50,000 in county.
Pembroke, Ky.	19.15	Too dark.	Light	Yes	ne.	e. to w	Direction of storm.	Peculiar	Yes	None ...	\$50,000.
Guthrie, Ky.	19.15	Too dark.	Heavy	Yes	ne.	.....	Same as storm ..	.....	.....	.....	.....
Bowling Green, Ky.	19.30	No	Yes	Yes	ne.	None	Same as storm ..	No	No	None ...	\$20,000.
Danville, Ky.	22.00	No	Moderate.	No .....	.....	None .....	.....	.....	.....	None ...	None.
Rowland, Ky.	23.30	Too dark.	Heavy	Yes	ne.	None .....	.....	No .....	.....	None ...	\$10,000.
Nashville, Tenn.	21.55	None .....	.....	.....	.....	.....	.....	.....	.....	None ...	15 to 20 buildings.
Gallatin, Tenn.	19.30	No	Yes	Slight .....	.....	No .....	.....	Yes	No	None ...	Slight.
Borville, Ky.	18.30	No	Heavy	Yes	ne.	No .....	.....	.....	.....	None ...	None.
Henderson, Ky.	18.45	No	Heavy	Yes	nne.	No	Same as storm ..	No	No	None ...	\$75,000.
Evansville, Ind.	18.30	No	Yes	Yes	nw.	.....	.....	No	No	None ...	\$5,000.
Chandler, Ind.	18.40	Not seen.	Heavy	Yes	n.	.....	Same as storm ..	Yes .....	.....	None ...	Nearly \$70,000.
Boonville, Ind.	19.00	Too dark.	Heavy	Yes	nnw.	Yes .....	.....	.....	.....	.....	.....
Huntingburg, Ind.	19.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crawfordsville, Ind.	12.00	No	Heavy .....	.....	ne.	.....	.....	Black	Yes	None ...	None.
Loogootee, Ind.	19.00	Yes	Yes	Yes	ene.	.....	.....	No	No	None ...	\$5,000.
Mitchell, Ind. ³	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bedford, Ind.	19.30	Too dark.	Light	Yes	ne.	No	With storm .....	.....	.....	None ...	\$30,000 to \$50,000.
Morgantown, Ind.	.....	.....	.....	.....	.....	.....	.....	.....	.....	None ...	Mostly fences.
Brooklyn, Ind.	20.45	Yes	Heavy	Yes	ne.	.....	.....	White .....	.....	None ...	\$5,000.
Mooreville, Ind.	20.30	.....	Yes	Yes	ne.	.....	.....	.....	.....	None ...	None.
Greenwood, Ind.	21.00	No	Light	No	n.	No	With storm	Fiery .....	.....	None ...	Slight.
Indianapolis, Ind.	20.28	No	Yes	No	ne.	No	do	No	No	None ...	\$6,000.
Brownburg, Ind.	21.30	Too dark.	Yes	Yes	ne.	No .....	.....	.....	.....	None ...	Barns.
McCordsville, Ind.	20.30	Too dark.	Heavy	Yes	ne.	Clockwise .....	.....	.....	.....	None ...	\$10,000.
Tipton, Ind. ⁴	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alexandria, Ind.	21.00	Too dark.	Light	Yes	ne.	No	With storm .....	.....	.....	.....	\$3,000.
Crawfordsville, Ark.	15.00	Yes	Some	Yes	ne.	No	do	Greenish	nw. and sw	None ...	\$10,000.
Shaw, Miss.	16.00	No	Light	Slight	ne.	.....	.....	Green	No	None ...	\$300 to \$500.
Cleveland, Miss.	16.00	No	Heavy	No	ne.	No .....	.....	.....	.....	None ...	None.
Renova, Miss.	16.30	Yes	Heavy	Yes	ne.	Clockwise .....	.....	Dark yellow....	.....	None ...	\$500.
Kelly, Miss. ⁵	15.58	Yes	Heavy	Yes	ne.	Counter clockwise	With storm mostly.	No	Yes	3 or 4	\$150,000 all about.
Olive Branch, Miss.	15.58	Yes	Heavy	Yes	ne.	.....	Every way .....	.....	.....	.....	\$150,000.
Richland, Miss. ⁶	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ellisville, Miss.	18.00	.....	Yes	Yes	ne.	.....	.....	.....	.....	2	6 or 7 houses.
Archibald, La.	16.00	Yes	Heavy	Yes	ne.	To center from both sides.	With storm mostly.	Yes	Yes	7	\$25,000.
Vosburg, Miss. ⁷	1.30	Too dark.	Heavy	Very heavy.	e.	.....	.....	.....	.....	Several	.....
Shubuta, Miss.	3.15	No	Light	Very great.	ne.	Counter clockwise	In a whirl	Reddish brown.	.....	3	Slight.
Tupelo, Miss. ⁸	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

¹ March 22.² 15 miles west.³ Storm passed over or around.⁴ 4 miles south.⁵ Same as next.⁶ No storm.⁷ March 24; 3 miles south.